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Proceedings of the Eleventh Annual Session of the Iowa Academy of Sciences: Staff & Committee Reports

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PROCEEDINGS

OF THE

ELEVENTH ANNUAL SESSION

OF THE

Iowa Academy of Sciences.

The eleventh annual session of the Iowa Academy of Sciences was held in committee room No. 1 of the capitol building in Des Moines, December 29 and 30, 1896. In business sessions the following matters of general interest were acted upon.

REPORT OF THE SECRETARY-TREASURER.

MEMBERS OF THE ACADEMY—The past year has been one of substantial progress for the Academy. We have added five fellows and seven associate members. Our proceedings were duly printed and form a volume of 230 pages.

It is my sad duty to chronicle the death of one of our most honored members, Dr. Chas. Wachsmuth, of Burlington, who died very soon after our last meeting. I would suggest that a committee be appointed to draft suitable resolutions to be published in our forthcoming volume of proceedings and to include, if possible, a sketch of his life.

FINANCIAL STATEMENT.

Accounts and vouchers submitted herewith show receipts of $151.69 and expenditures of $79.72, leaving a balance charged to the treasurer of $71.97.

SUMMARY OF RECEIPTS AND EXPENDITURES.

RECEIPTS.

Balance from last year	$ 55.99
Membership fees	37 00
Annual dues from members	55.00
Proceedings sold	4.70
Total	$151.69

EXPENDITURES.

Stamps and stamped enveloves	$ 4.84
Printing programs, notices, receipts, etc.	11.00
Reprints of author's extras	32.00
Express and postage on proceedings	21.91
Miscellaneous items of expense	9 97
Total	$ 79.72

The committee on treasurer's accounts reported as follows:

To the Iowa Academy of Sciences: Your committee appointed to examine the accounts of the treasurer find the same to be correct.

(Signed) G. E. FINCH,
A. A. VEBLEN,
A. G. LEONARD,
Committee.

Resolutions urgently opposing the pending bill in congress for the restriction of experiments on living animals were passed, also one in support of the movement for a director of scientific bureaus in the department of agriculture.

A subscription was voted for the Pasteur monument fund.

In addition to the appended papers, read in full or by title and which were by vote of the council referred to the secretary for publication, the following subjects were presented:

Mr. Charles Carter, of Fairfield, remarked upon the Iowa Odonata, calling attention to what had been done in the way of study of our native species and requesting the members to assist him by sending specimens of such species as they could with a view to the preparation of a catalogue of the species of the state.

Prof. A. H. Conrad, of Fairfield, read some preliminary notes on the Ophidia of Iowa, indicating the extent to which the species of the state are known, the probability of the rapid extermination of many of the species and the desirability of a prompt study of our native fauna. He requests material and correspondence.

Professor Conrad exhibited an archæological specimen recently unearthed near Fairfield: a small box hollowed from

two pieces of wood evidently hermetically sealed and which contained sheets of birch bark bearing aboriginal hieroglyphs.

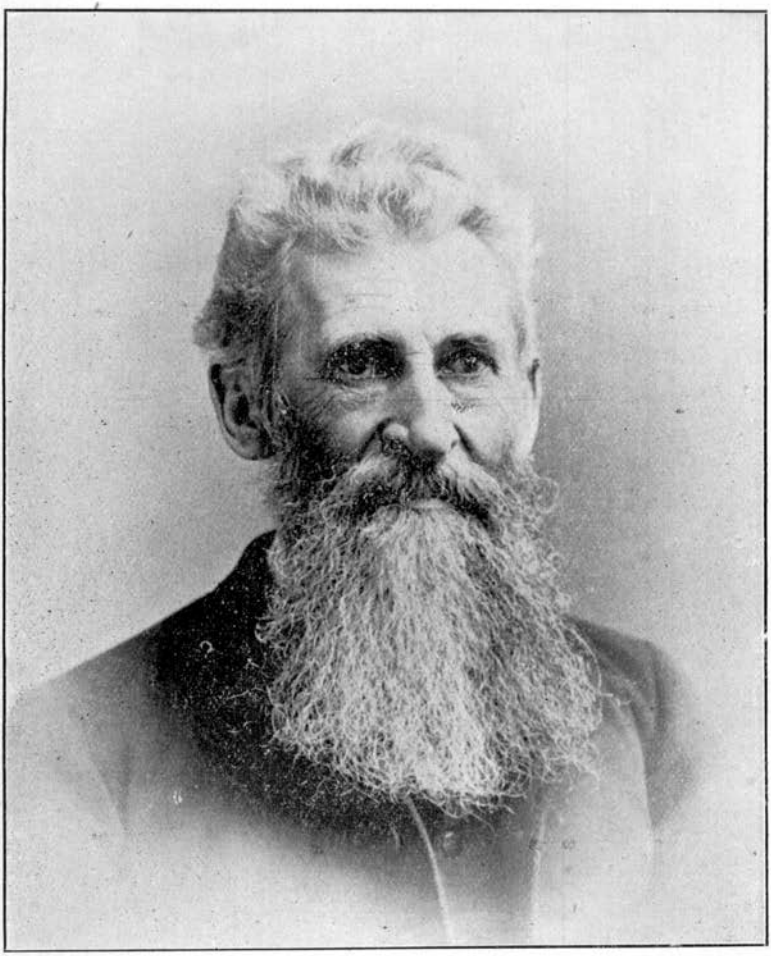
The committee appointed to prepare a memorial in honor of Dr. Charles Wachsmuth and consisting of Prof. Samuel Calvin and Dr. Charles R. Keyes, presented the following sketch, prepared by the long time friend and former co-laborer of Dr. Wachsmuth, Dr. Charles R. Keyes. The plate for the portrait was kindly loaned by Mr. Charles Aldrich, of the historical department.

MEMORIAL OF CHARLES WACHSMUTH.

Since our last annual gathering the Academy has lost one of its most illustrious and honored members, the state one of its most distinguished citizens and American science one of its most indefatigable workers. By the death of Charles Wachsmuth an epoch in the history of Iowa science closes. To those of you who were intimately acquainted with our departed friend and associate no words that we can utter will seem extravagant. Yet it appears befitting at this time, especially for the consideration of those of you who were not so fortunate as to come in frequent contact with him, to give some estimate of his personality and worth.

Charles Wachsmuth was born September 13, 1829, in the city of Hannover, Germany. He was the only son of a lawyer of considerable reputation who was a member, in 1848, of the German parliament of Frankfurt. From early childhood he was always in feeble health. It was the wish of his father that he should study law, and he was accordingly sent at an early age to the high school of his native place to receive a classical education; but to his father's great grief and his own, he was obliged, at the age of sixteen, to give up all studies on account of failing health, and on the advice of the attending physician to enter a mercantile career.

In 1852 the young Hannoverian came to America, having been sent to New York as an agent of a Hamburg shipping house, in which capacity he served for a period of over two years. Severe illness compelled him to leave the sea coast, and upon the advice of friends he settled in Burlington. In 1855 Mr. Wachsmuth was married, and in the same year embarked on his own account. The dry, western country did not bring about the expected improvement in health, and his physician advised that as much time as possible should be spent in the open air, suggesting that the collecting of fossils, which abounded in the rocks of the neighborhood, would soon provide an incentive for sufficient exercise. It did not take long for him to develop into an enthusiastic collector, so that days at a time were spent in quarries and ravines around the city, his wife often looking after the store. The new mode of life at once produced a wonderful improvement of health. In the course of a few years a fine collection of crinoids had been brought together. It reached such dimensions that it attracted



Yours very truly
Charles Schmidt

the attention of eastern scientists. Prof. Louis Agassiz came to see it on his lecturing trip to the west, and Meek and Worthen asked the loan of specimens for description in the geological reports of Illinois, which were then being prepared.

In 1865 Mr. Wachsmuth closed out his business and, accompanied by his wife, made a trip to Europe. On his way he visited Cambridge, upon invitation of Professor Agassiz, and saw the large collections in the Museum of Comparative Zoology. Until then he had seen very few crinoids aside from those found at Burlington. His delight knew no bounds as he studied in Cambridge the fossil crinoids from other localities, and a number of specimens of living types. In Europe all sorts of invertebrate fossils were collected and visits made to the principal museums. When England was reached it was a great surprise to find that the reputation of the Burlington collection had already preceded him.

On returning to Burlington, after an absence of almost a year, Mr. Wachsmuth resolved to devote the rest of his life to scientific pursuits, and to direct his whole attention to crinoids. Living far from scientific centers, and not having access to literature, he had to depend for study largely upon his own specimens. This, however, proved afterwards an advantage, rather than a drawback, for independent thought and original research.

It was in 1873 that Professor Agassiz, on his return from the Pacific coast, paid a second visit to Burlington. He was greatly surprised at the enormous growth of the collection since he had last seen it, and, struck by the beauty and perfection of the specimens, he intimated that he was anxious to procure the collection for Cambridge, at the same time expressing a desire to have Mr. Wachsmuth go with it and take charge of all the crinoids in the museum. The negotiations were soon completed, and a few months later Mr. Wachsmuth was installed in the Museum of Comparative Zoology as an assistant. It was Professor Agassiz who induced the new assistant to publish the results of his observations under his own name, on the ground that he was doing a great injustice to himself by placing them in the hands of others. The position, which was held until the death of Professor Agassiz, gave ample opportunity for Mr. Wachsmuth to become fully acquainted with the literature on the crinoids, and it was here that the foundation of the later great work was laid.

After the death of Agassiz a second trip to Europe and a visit to the Orient, was made. On returning in 1874 Mr. Wachsmuth had not a single specimen in his possession. However, it took only a few years to make up another collection that was larger and much superior to the first. A year or two later he made the acquaintance of Mr. Frank Springer, then a young lawyer of Burlington, and an enthusiastic student of the natural sciences; a warm friendship soon sprung up between them. They studied together, and from 1878 the results of their researches were published under joint authorship. In the following years the collections increased rapidly by extensive purchases. From a trip to Europe Mr. Springer brought home a fine selection of Dudley crinoids, embracing nearly all of the species of that locality, and a large assortment of the Carboniferous species of England and Ireland. Among his acquisitions were also rare forms from Belgium, a majority of the Eifel species, fine specimens from Russia and Bohemia, and a large amount of material from the Mesozoic and later formations. The collection was enlarged further by extensive

exchanges with collectors in this country and Europe, and by having collectors in the field. Liberal purchases for the library were made, and when work was commenced on the monograph, nearly the whole crinoidal literature, from the time of J. S. Miller to date, was at hand. By examining the titles of their publications it will be noticed that Wachsmuth and Springer took very little pride in describing new species, their attention being directed mainly to the morphology, with a view to classification, and to the revision of the work of the earlier writers. As the work of the monograph was nearing completion, Prof. Alexander Agassiz, the present director of the Museum of Comparative Zoology, offered to publish it, in the best style possible, as one of the memoirs of the museum, and in this series it now appears, a model of typographic art.

Mr. Wachsmuth was at one time vice-president of this society. He was also a fellow of the American Association for the Advancement of Science, of the Geological Society of America, and of the Davenport Academy of Sciences. He was a corresponding member of the Philadelphia Academy of Natural Sciences, and a member of the Imperial Society of Natural Sciences, of Moscow, Russia. For many years he carried on an extensive and intimate correspondence with leading scientists of this country and Europe. That which passed between Dr. P. Herbert Carpenter, the most eminent European authority on Echinoderms, and Mr. Wachsmuth during the past ten years would alone fill a large volume.

For many years Mr. Wachsmuth was in delicate health and was obliged to spend the winter seasons in the South. The early spring was usually passed in the mountains of Alabama, Tennessee and Kentucky, where immense collections of both crinoids and blastoids were brought together. On all of these trips he was accompanied by his faithful wife, who is, herself an excellent and indefatigable collector.

The sudden demise of our associate took place on February 7, 1896.

Although rarely able to be present at the meetings of our Academy no member took greater interest in its deliberations nor had greater solicitude for its welfare and progress.

From early childhood Mr. Wachsmuth possessed a frail constitution which continually threatened to give away, yet he withstood the inroads of an organic disease long enough to nearly complete the allotted span of human life, of three score years and ten. During the last three years his health gradually failed, until for several months previous to the end, herculean efforts were necessary to enable him to work even for a short time each day. His last illness covered only a few days, and even the iron will, which had so often before overcome a long-standing ailment, finally had to give up to the physically weak heart. To within a day of his demise, with a zeal that is begotten only for love of the sublime, he continued to apply himself to the finishing stages of the crowning glory of his life—the Monograph of the Fossil Crinoids. The first half only was written and the final proofs of this part were barely read when the angel of death beckoned him. The triumphant joy of beholding the completed structure of a noble life's work was not his lot. Deprivation of what he held dearest took the place of conquering satisfaction, in the very hour of victory.

Few outside of the little circle of workers directly interested in the rather limited field of investigation can appreciate the great importance and originality of Mr. Wachsmuth's work. Compared with the extent of

the great field of science itself the results may seem small; measured by the standard of individual achievement the outcome is stupendous. In the special department of knowledge which he represented no one person has done more to raise it to the high place that it now occupies.

Wachsmuth belonged to that illustrious school of naturalists which Louis Agassiz founded in this country. His main efforts were entirely along the lines of inquiry pointed out by the Swiss savant. It was the establishment, upon a morphological basis, of a rational classification of a group of organisms. The group chosen was the crinoids, or sea lilies, a class of animals which is now all but extinct, but which in ages past was one of the most abundant forms of life. Most of the material was fossil and the difficulties surrounding the investigation were such as to students of living animals would be insurmountable. Although the work was far from finished at the time of his demise the main and most important features of the scheme were fully established and the Wachsmuth classification of crinoids has been adopted the world over.

In the Monograph of the Fossil Crinoids, which is a huge quarto of 800 pages in two parts and an atlas of eighty plates, is contained the mature reflections of thirty years' continuous thought and reflection. Twenty years ago, when at Cambridge with Agassiz, the foundations of his life's work were laid In a little paper "On the Internal and External Structures of Paleozoic Crinoids," published in 1877, was stated the essential propositions on which rested all subsequent work. The ancient crinoids were divided into three primary groups, the separation being based chiefly upon the structure of the tegmen.

The effects of Wachsmuth's work has been completely to revolutionize the ideas which prevailed concerning the crinoids and to place the whole systematic arrangement of the groups upon an enduring basis. The stages in the development of those changes are easily traced in the various publications which were issued from time to time and culminated in the monumental monograph.

THE STATE QUARRY LIMESTONE.

BY SAMUEL CALVIN.

At the state quarries, or North Bend quarries, in sections 5 and 8 of Penn township, Johnson county, Iowa, there is a body of limestone of Devonian age, possessing marked characteristics which set it off sharply from the rest of the Devonian in the upper Mississippi valley. The formation has a thickness of about forty feet. At present there is some uncertainty as to its exact taxonomic relations.

On fresh fracture the state quarry rock is light gray in color. In texture it varies somewhat in different beds, but

near the middle of the formation it is composed of coarse, imperfectly comminuted fragments of brachiopod shells cemented together, the spaces being filled with interstitial calcite. Among the recognizable species of shells *Atrypa reticularis* is the most common, but some beds contain very large numbers of *Terebratula* (*Cranœna*) *iowensis*. At some horizons shells of an Orthothetes are common. *Orthis impressa* is not rare, and *Rynchonella pugnus* (*Pugnax pugnus*) occurs occasionally. The shells, or fragments of shells, making up the limestone are not embedded in a matrix. They are simply piled on each other and cemented together in a manner illustrated by the formation of the modern coquina along the east coast of Florida. The rocks near the middle of the state quarry beds are a brachiopod coquina having the interstices completely filled with crystalline calcite.

Near the middle of the formation the rock consists of thick ledges which, some years ago, were worked extensively. From these beds came the large limestone blocks used in the foundation of the new state capitol. Although the ledges show no definite lamination, and split as readily in one direction as another, the weathered surfaces on opposite sides of the numerous joints often show obscure signs of oblique bedding. The material was evidently swept into place by moderately strong currents.

The ledges worked in connection with the building of the new capitol are the heaviest afforded by the formation. The lowest one is four feet in thickness. It is made up of rather finely triturated brachiopod shells, the most common species being *Atrypa reticularis*. This bed, it seems, did not furnish satisfactory material for it was quarried only to a limited extent. The ledge furnishing the greater number of available blocks lies directly above the first. It is five feet in thickness, and is intersected by numerous joints. Among the great multitude of unrecognizable fragments of which it is chiefly composed it contains large numbers of entire detached valves of Atrypa and Orthothetes. The next ledge in ascending order to furnish usable stone is separated from the last by a talus-covered space of two or three feet. It also is five feet thick, and in it Atrypa and Terebratula are the prevailing brachio pods. In a fourth ledge, four feet in thickness, the rock is fine grained, the materials are very perfectly comminuted, species cannot be recognized, but it is evident that the bed is composed of debris from brachiopod shells mingled with triturated fragments of crinoids. Above the fourth ledge the layers vary

from six inches to two feet in thickness, and toward the upper part of the exposure the rock is made up almost wholly of the remains of crinoids.

Below the first ledge noted above the beds vary from a few inches to a foot or more in thickness, the thinner beds prevailing near the base of the formation. Brachiopod shells constitute the major part of the material of which they are composed.

Among the waste material of the main quarry there are many large blocks, eighteen inches thick, through which masses of chert are irregularly distributed. The position of the bed from which the chert-bearing blocks were obtained was not determined, though it is probable that it lies in the talus-covered space between ledges two and three of the main workable portion of the quarry. Whatever its position, it is a bed of remarkable interest, for it is in places crowded with fish teeth that lie embedded in the chert or among triturated brachiopod shells in the calcareous portions of the layer. It looks as if an entire fish fauna had suffered death at once. Such general fatality may have been produced by any one of several probable causes; and, furthermore, the cause was doubtless in some way related to the crustal movements recorded in the region, and to be noted further on. Changes in oceanic currents attended by rapid elevation or depression of temperature, earthquake shocks even, or concentration of sea water in an isolated basin, would be competent to produce the observed result. Whatever the cause, it was effective, and every square yard of sea bottom received its quota of dead fishes.

Several genera and species are indicated amid the profusion of fish remains interred in this old cemetery. One of the most common forms is the well known Devonian type, Ptyctodus. Teeth of this genus are sometimes literally crowded together to form a sort of fish tooth conglomerate. These teeth, or tritors, vary in size and shape and in the degree of wear to which they were subjected before the death of their owners; but in the opinion of experts to whom they have been submitted, they probably all belong to the single species, *Ptyctodus calceolus.* Along with Ptyctodus are remains of one or more species of Devonian Placoderms, as indicated by great numbers of imperfect dermal plates. The Dipnoan genus, Dipterus, is represented by a number of the interesting wing shaped teeth characteristic of this very old but persistent type; and there are

teeth evidently related to Dipterus, but so different as probably to make generic separation necessary.

But more interesting than all the rest, and far outnumbering the teeth that could at first sight be referred to Dipterus or to related genera, is a vast assemblage of teeth of varying shapes and dimensions, that bear a striking external resemblance to the crushing teeth of certain genera of sharks. In the opinion of Dr. C. R. Eastman, however, it is doubtful if there are any Selachian teeth in the entire lot. He finds that, microscopically, they all, so far as sections have been made, are identical in structure with the teeth of Lung fishes, or Dipnoans. They seem, indeed, to be primitive Dipnoans exhibiting a stage of evolution not far removed from the point whence the Dipnoan and Elasmobranch types diverged; and their careful study will doubtless throw much light on the nature of the relationships existing between these two groups of fishes. Dipterine fishes have long been known from the Devonian of eastern Europe, but it is only recently that this type has been found in the Devonian of America. Until the discovery of the State quarry fish bed, our Devonian Dipterines all belonged to a single genus and came from the upper Devonian formations of Pennsylvania. Now we find the type in the Mississippi valley, and here it is represented by several genera, and is connected by intergradations with exceedingly primitive Dipnoan forms. The material has been placed in the hands of Dr. Eastman, whose full report on the subject will be awaited with much interest.

Distribution.—At present the state quarry limestone is known only in Johnson county, Iowa, though it doubtless occurs at other points in Iowa and adjacent states. The main body occurs in sections 5 and 8 of Penn township (T. 80 N., R. 6 W.). It is found in the bluffs on the west side of the Iowa river from the north line of section 5 to a little more than one-fourth of a mile below the north line of section 8, the principal development occurring near the south side of the first named section. The width of the area occupied by the formation in this region is less than half a mile. In fact in following up the small tributary valleys the state quarry stone is in most cases found to disappear in less than one-fourth of a mile.

A second body of state quarry limestone is found near the southwest corner of section 20, of Graham township, at which point the formation is almost exclusively crinoidal as to composition; a third body of this limestone, but of no great thickness,

is seen near the top of the hill southeast of the bridge over Turkey creek in section 23, Newport township; and another body of the same stone occurs in rather puzzling relations to the Megistocrinus beds in section 23, Big Grove township, southwest of Solon. At the last named locality Rynchonella, or Pugnax, is the prevailing fossil. The very fossiliferous limestone seen near the base of the quarry south of Shueyville is of a very different character and belongs to a different horizon.*

Taxonomic Relations.—As already intimated, the taxonomic relations of the state quarry stone are not very clear. At first it seemed that it might possibly represent local deposits made contemporaneously with the Cedar valley beds, but later investigations indicate that it is younger than the Cedar valley and was laid down on a deeply eroded surface. In support of this view it may be noted that at the mouth of the ravine below the south quarries in section 5 of Penn township, the state quarry stone rests on the Megistocrinus beds of the Cedar valley stage. In following up the ravine the quarry stone rises higher and higher in the bluffs and soon disappears, while the members of the normal Cedar valley section appear successively in the bottom of the creek. The contact of the two formations cannot, however, be definitely traced. On Rapid creek, in section 20 of Graham township, the relations are nearly the same. The state quarry stone occurs only a short distance above the Megistocrinus beds. At Solon the equivalent of the quarry stone occurs on the west side of a small ravine, while on the east side of the ravine, only four or five rods distant, the typical Megistocrinus beds, wholly different in character and with an entirely different fauna, occur at the same level. The quarry beds at the last named locality are composed largely of shells of Pugnax (Rynchonella). They extend westward along the north side of the valley of a small creek for about one-eighth of a mile and then suddenly disappear, their place in the low bluff being taken by the normal Megistocrinus beds of the Cedar valley section.

In the bluffs above the bridge over Turkey creek, at the point already noted, in section 23 of Newport township, these beds occur above the white limestone at the top of the Cedar valley formation. No Devonian beds of any kind have so far been

*McGee: Tenth Census Rept. Vol. X, Quarries and Building Stone, p. 262.

found above the state quarry stone. The anomalous relations of this formation, the limited areas to which it is confined, the abrupt manner in which it appears and disappears, sometimes at the level of one member of the Cedar valley section and sometimes at the level of another, all lead to the conclusion that it was deposited uncomformably on the Cedar valley limestone after the lapse of a considerable erosion interval. The same view is even more strongly suggested by the fact that in certain respects the fauna of the state quarry beds is unique. The deposit near Solon furnishes *Pugnax pugnus* Martin, *Melocrinus calvini* Wachsmuth, and a very peculiar Stromatoporoid, none of which are found in the other Devonian formations. Of other species that have a greater vertical range, as for example *Atrypa reticularis*, there is sufficient variation to distinguish them from individuals of the same species found at other horizons. The Orthothetes, so common in the beds in section 5 of Penn township, is associated with Pugnax, and like it is limited to the state quarry stage. The great mass of cemented crinoidal debris composing the beds in Graham township and the upper ten or fifteen feet of the formation at the state quarries has no parallel in any other stage of the Iowa Devonian. The presence of Dipterus, which elsewhere occurs only in the Upper Devonian, is likewise indicative of an interval between this stage and the Cedar valley beds below. In this connection it may be noted that the affinities of *Pugnax pugnus* is with the Carboniferous rather than the Devonian. These facts, coupled with the evidence of unconformity, would seem to place the formation near the closing stage of the Upper Devonian system, while the faunas of the Cedar valley stage correlate it with the Middle Devonian. The known phenomena concerning the state quarry limestone and its interesting fauna evidently require for their interpretation a number of crustal movements and a long period of erosion in the Iowa Devonian heretofore unsuspected.